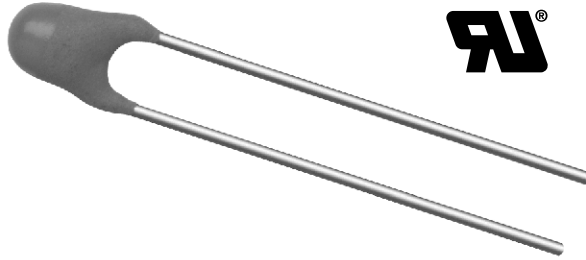


## NTC Thermistors, Radial Leaded, Standard Precision



### FEATURES

- Accuracy over a wide temperature range
- High stability over a long life
- Excellent price/performance ratio
- UL recognized, file E148885
- Old part number was 2322 640 3/4/6....
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC


**RoHS**  
COMPLIANT

### APPLICATIONS

- Temperature measurement, sensing and control, temperature compensation in industrial and consumer electronics

### DESCRIPTION

These thermistors have a negative temperature coefficient. The device consists of a chip with two solid copper tin plated leads. It is grey lacquered and color coded, but not insulated.

### PACKAGING

The thermistors are packed in bulk or tape on reel; see code numbers and relevant packaging quantities.

### DESIGN-IN SUPPORT

For complete Curve Computation, visit:  
[www.vishay.com/thermistors/curve-computation-list/](http://www.vishay.com/thermistors/curve-computation-list/)

### MARKING

The thermistors are marked with colored bands; see dimensions drawing and "Electrical data and ordering information".

### MOUNTING

By soldering in any position.  
Not intended for potted applications.

| QUICK REFERENCE DATA                                   |  |
|--|--|
| PARAMETER  | VALUE  |
| Resistance value at 25 °C                              | 3.3 Ω to 470 kΩ                                    |
| Tolerance on $R_{25}$ - value                          | ± 2 %; ± 3 %; ± 5 %                                |
| $B_{25/85}$ - value                                    | 2880K to 4570K                                     |
| Tolerance on $B_{25/85}$ - value                       | ± 0.5 % to ± 3 %                                   |
| Maximum dissipation                                    | 500 mW   |
| Dissipation factor $\delta$<br>(for information only)  | 7 mW/K<br>8.5 mW/K<br>(for $R_{25}$ value ≤ 680 Ω) |
| Response time  | 1.2 s  |
| Thermal time constant $\tau$<br>(for information only) | 15 s   |
| Operating temperature range:                           |  |
| at zero dissipation; continuously                      | - 40 °C to + 125 °C                                |
| at zero dissipation; for short periods                 | ≤ 150 °C   |
| at maximum dissipation                                 | 0 °C to 55 °C                                      |
| Climatic category acc. IEC 60068-1                     | 40/125/56  |
| Weight   | ≈ 0.3 g  |

### ELECTRICAL DATA AND ORDERING INFORMATION

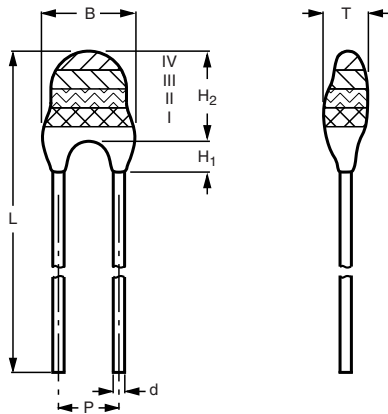
| $R_{25}$<br>[Ω] | $B_{25/85}$ - VALUE |       | UL<br>APPROVED<br>[Y/N] | 12NC ORDERING CODE<br>2381 640 6.... (1) | SAP MATERIAL NO.<br>NTCLE100E3..... (2) | COLOR CODE (3) |        |       |
|-----------------|---------------------|-------|-------------------------|--|---|----------------|--------|-------|
|                 | [K]                 | [± %] |                         |  |   | I              | II     | III   |
| 3.3             | 2880                | 3     | N                       | *338                                     | 338*B0                                  | Orange         | Orange | Gold  |
| 4.7             | 2880                | 3     | N                       | *478                                     | 478*B0                                  | Yellow         | Violet | Gold  |
| 6.8             | 2880                | 3     | N                       | *688                                     | 688*B0                                  | Blue           | Grey   | Gold  |
| 10              | 2990                | 3     | N                       | *109                                     | 109*B0                                  | Brown          | Black  | Black |
| 15              | 3041                | 3     | N                       | *159                                     | 159*B0                                  | Brown          | Green  | Black |
| 22              | 3136                | 3     | N                       | *229                                     | 229*B0                                  | Red            | Red    | Black |
| 33              | 3390                | 3     | Y                       | *339                                     | 339*B0                                  | Orange         | Orange | Black |
| 47              | 3390                | 3     | Y                       | *479                                     | 479*B0                                  | Yellow         | Violet | Black |
| 68              | 3390                | 3     | Y                       | *689                                     | 689*B0                                  | Blue           | Grey   | Black |
| 100             | 3560                | 1.5   | N                       | *101                                     | 101*B0                                  | Brown          | Black  | Brown |
| 150             | 3560                | 1.5   | N                       | *151                                     | 151*B0                                  | Brown          | Green  | Brown |
| 220             | 3560                | 1.5   | N                       | *221                                     | 221*B0                                  | Red            | Red    | Brown |
| 330             | 3560                | 1.5   | N                       | *331                                     | 331*B0                                  | Orange         | Orange | Brown |
| 470             | 3560                | 1.5   | N                       | *471                                     | 471*B0                                  | Yellow         | Violet | Brown |

| ELECTRICAL DATA AND ORDERING INFORMATION |                            |            |                         |   |  |                           |        |        |
|--|----------------------------|------------|-------------------------|---|--|---------------------------|--------|--------|
| $R_{25}$<br>[ $\Omega$ ]                 | $B_{25/85}$ - VALUE<br>[K] |            | UL<br>APPROVED<br>[Y/N] | 12NC ORDERING CODE<br>2381 640 6.... <sup>(1)</sup> | SAP MATERIAL NO.<br>NTCLE100E3..... <sup>(2)</sup> | COLOR CODE <sup>(3)</sup> |        |        |
|  |                            | [ $\pm$ %] |                         |   |  | I                         | II     | III    |
| 680                                      | 3560                       | 1.5        | N                       | *681  | 681*B0   | Blue                      | Grey   | Brown  |
| 1000                                     | 3528                       | 0.5        | N                       | *102  | 102*B0   | Brown                     | Black  | Red    |
| 1500                                     | 3528                       | 0.5        | N                       | *152  | 152*B0   | Brown                     | Green  | Red    |
| 2000                                     | 3528                       | 0.5        | N                       | *202  | 202*B0   | Red                       | Black  | Red    |
| 2200                                     | 3977                       | 0.75       | Y                       | *222  | 222*B0   | Red                       | Red    | Red    |
| 2700                                     | 3977                       | 0.75       | Y                       | *272  | 272*B0   | Red                       | violet | Red    |
| 3300                                     | 3977                       | 0.75       | Y                       | *332  | 332*B0   | Orange                    | Orange | Red    |
| 4700                                     | 3977                       | 0.75       | Y                       | *472  | 472*B0   | Yellow                    | Violet | Red    |
| 5000                                     | 3977                       | 0.75       | Y                       | *502  | 502*B0   | Green                     | Black  | Red    |
| 6800                                     | 3977                       | 0.75       | Y                       | *682  | 682*B0   | Blue                      | Grey   | Red    |
| 10 000                                   | 3977                       | 0.75       | Y                       | *103  | 103*B0   | Brown                     | Black  | Orange |
| 12 000                                   | 3740                       | 2          | Y                       | *123  | 123*B0   | Brown                     | Red    | Orange |
| 15 000                                   | 3740                       | 2          | Y                       | *153  | 153*B0   | Brown                     | Green  | Orange |
| 22 000                                   | 3740                       | 2          | Y                       | *223  | 223*B0   | Red                       | Red    | Orange |
| 33 000                                   | 4090                       | 1.5        | N                       | *333  | 333*B0   | Orange                    | Orange | Orange |
| 47 000                                   | 4090                       | 1.5        | N                       | *473  | 473*B0   | Yellow                    | Violet | Orange |
| 50 000                                   | 4190                       | 1.5        | N                       | *503  | 503*B0   | Green                     | Black  | Orange |
| 68 000                                   | 4190                       | 1.5        | N                       | *683  | 683*B0   | Blue                      | Grey   | Orange |
| 100 000                                  | 4190                       | 1.5        | N                       | *104  | 104*B0   | Brown                     | Black  | Yellow |
| 150 000                                  | 4370                       | 2.5        | Y                       | *154  | 154*B0   | Brown                     | Green  | Yellow |
| 220 000                                  | 4370                       | 2.5        | Y                       | *224  | 224*B0   | Red                       | Red    | Yellow |
| 330 000                                  | 4570                       | 1.5        | N                       | *334  | 334*B0   | Orange                    | Orange | Yellow |
| 470 000                                  | 4570                       | 1.5        | N                       | *474  | 474*B0   | Yellow                    | Violet | Yellow |

**Notes**

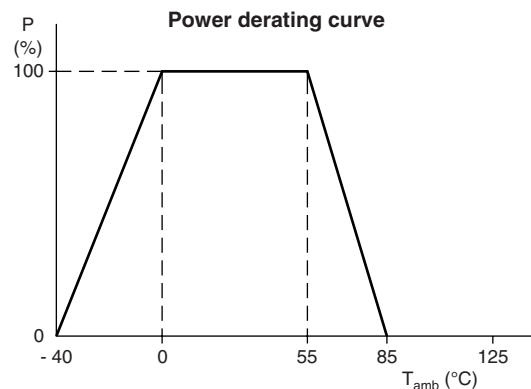
- (1) Replace \* in 12NC by 3 for 5 %, 6 for 3 %, 4 for 2 %
- (2) Replace \* in SAP by J for 5 %, H for 3 %, G for 2 %
- (3) For  $R_{25} \pm 2$  % band IV is red,  $\pm 3$  % band IV is orange,  $\pm 5$  % band IV is gold

**DIMENSIONS** in millimeters



2381 640 6.338 to 6.474

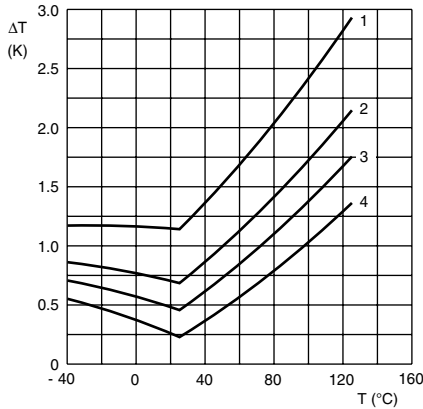
**DERATING AND TEMPERATURE TOLERANCES**



| PHYSICAL DIMENSIONS FOR RELEVANT TYPE (all dimensions in millimeters) |               |                |       |      |            |              |      |            |
|---|---------------|----------------|-------|------|------------|--------------|------|------------|
| CODE NUMBER<br>2381 640 .....   | $B_{max.}$    | $d$            | $H_1$ |      | $H_2$ max. | $L$          | $P$  | $T_{max.}$ |
|   |               |                | Min.  | Max. |            |              |      |            |
| 6.338 to 6.221  | 5.0           | $0.6 \pm 0.06$ | 1.0   | 4.0  | 6.0        | $24 \pm 1.5$ | 2.54 | 4.0        |
| 6.331 to 6.474  | $3.3 \pm 0.5$ | $0.6 \pm 0.06$ | 1.0   | 3.0  | 6.0        | $24 \pm 1.5$ | 2.54 | 3.0        |

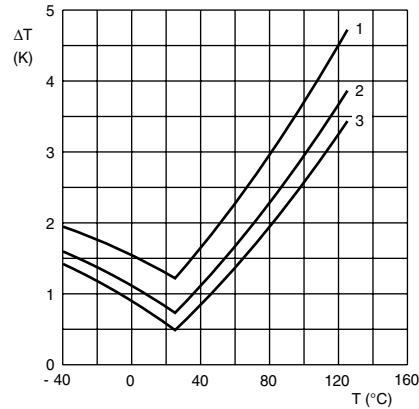


**TEMPERATURE DEVIATION AS A FUNCTION OF THE AMBIENT TEMPERATURE**



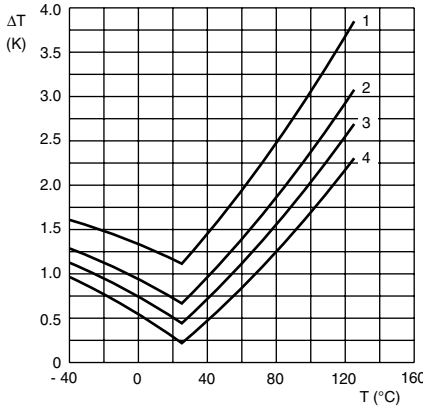
Curves valid for 2.2 to 10 kΩ  
 Curve 1:  $\Delta R_{25}/R_{25} = 5\%$   
 Curve 2:  $\Delta R_{25}/R_{25} = 3\%$   
 Curve 3:  $\Delta R_{25}/R_{25} = 2\%$   
 Curve 4:  $\Delta R_{25}/R_{25} = 1\%$   
 (for 2381 640 5.... series only)

**TEMPERATURE DEVIATION AS A FUNCTION OF THE AMBIENT TEMPERATURE**



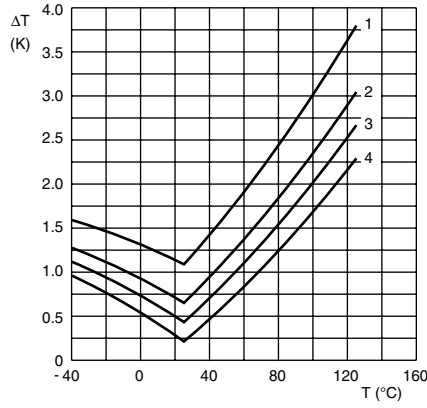
Curves valid for 12 to 22 kΩ  
 Curve 1:  $\Delta R_{25}/R_{25} = 5\%$   
 Curve 2:  $\Delta R_{25}/R_{25} = 3\%$   
 Curve 3:  $\Delta R_{25}/R_{25} = 2\%$

**TEMPERATURE DEVIATION AS A FUNCTION OF THE AMBIENT TEMPERATURE**



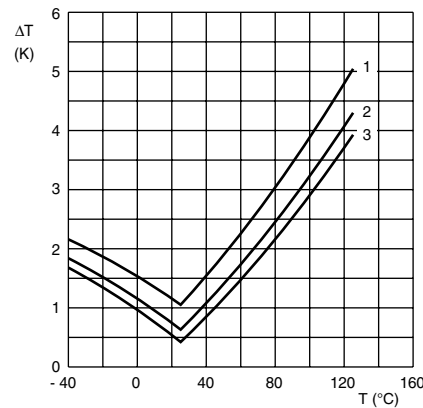
Curves valid for 33 to 47 kΩ  
 Curve 1:  $\Delta R_{25}/R_{25} = 5\%$   
 Curve 2:  $\Delta R_{25}/R_{25} = 3\%$   
 Curve 3:  $\Delta R_{25}/R_{25} = 2\%$   
 Curve 4:  $\Delta R_{25}/R_{25} = 1\%$   
 (for 2381 640 5.... series only)

**TEMPERATURE DEVIATION AS A FUNCTION OF THE AMBIENT TEMPERATURE**



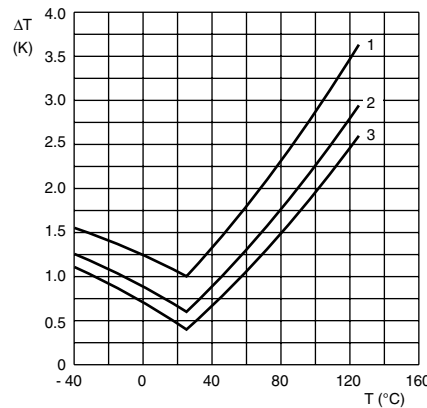
Curves valid for 68 to 100 kΩ  
 Curve 1:  $\Delta R_{25}/R_{25} = 5\%$   
 Curve 2:  $\Delta R_{25}/R_{25} = 3\%$   
 Curve 3:  $\Delta R_{25}/R_{25} = 2\%$   
 Curve 4:  $\Delta R_{25}/R_{25} = 1\%$   
 (for 2381 640 5.... series only)

**TEMPERATURE DEVIATION AS A FUNCTION OF THE AMBIENT TEMPERATURE**



Curves valid for 150 to 220 kΩ  
 Curve 1:  $\Delta R_{25}/R_{25} = 5\%$   
 Curve 2:  $\Delta R_{25}/R_{25} = 3\%$   
 Curve 3:  $\Delta R_{25}/R_{25} = 2\%$

**TEMPERATURE DEVIATION AS A FUNCTION OF THE AMBIENT TEMPERATURE**



Curves valid for 330 to 470 kΩ  
 Curve 1:  $\Delta R_{25}/R_{25} = 5\%$   
 Curve 2:  $\Delta R_{25}/R_{25} = 3\%$   
 Curve 3:  $\Delta R_{25}/R_{25} = 2\%$



**R<sub>T</sub> VALUE AND TOLERANCE**

These thermistors have a narrow tolerance on the B-value, the result of which provides a very small tolerance on the nominal resistance value over a wide temperature range. For this reason the usual graphs of  $R = f(T)$  are replaced by Resistance Values at Intermediate Temperatures Tables, together with a formula to calculate the characteristics with a high precision.

**FORMULAE TO DETERMINE NOMINAL RESISTANCE VALUES**

The resistance values at intermediate temperatures, or the operating temperature values, can be calculated using the following interpolation laws (extended "Steinhart and Hart"):

$$R(T) - R_{ref} \times e^{(A+B/T+C/T^2+D/T^3)} \quad (1)$$

$$T(R) = \left( A_1 + B_1 \ln \frac{R}{R_{ref}} + C_1 \ln^2 \frac{R}{R_{ref}} + D_1 \ln^3 \frac{R}{R_{ref}} \right)^{-1} \quad (2)$$

where:

A, B, C, D, A<sub>1</sub>, B<sub>1</sub>, C<sub>1</sub> and D<sub>1</sub> are constant values depending on the material concerned; see table below.

R<sub>ref</sub> is the resistance value at a reference temperature (in this event 25 °C).

T is the temperature in K.

Formulae numbered and are interchangeable with an error of max. 0.005 °C in the range 25 °C to 125 °C and max. 0.015 °C in the range - 40 °C to + 25 °C.

**DETERMINATION OF THE RESISTANCE/TEMPERATURE DEVIATION FROM NOMINAL VALUE**

The total resistance deviation is obtained by combining the 'R<sub>25</sub>-tolerance' and the 'resistance deviation due to B-tolerance'.

When:

- X = R<sub>25</sub>-tolerance
- Y = resistance deviation due to B-tolerance
- Z = complete resistance deviation,

then:  $Z = \left[ \left( 1 + \frac{X}{100} \right) \times \left( 1 + \frac{Y}{100} \right) - 1 \right] \times 100\%$  or  $Z \approx X + Y$

When:

- TCR = temperature coefficient
- ΔT = temperature deviation,

then:  $\Delta T = \frac{Z}{TCR}$

The temperature tolerances are plotted in the graphs on the previous page.

**Example:** at 0 °C, assume X = 5 %, Y = 0.89 % and TCR = 5.08 %/K (see Table ), then:

$$Z = \left\{ \left[ 1 + \frac{5}{100} \right] \times \left[ 1 + \frac{0.89}{100} \right] - 1 \right\} \times 100\%$$

$$= \{ 1.05 \times 1.0089 - 1 \} \times 100\% = 5.9345\% (\approx 5.93\%)$$

$$\Delta T = \frac{Z}{TCR} = \frac{5.93}{5.08} = 1.167 \text{ °C } (\approx 1.17 \text{ °C})$$

A NTC with a R<sub>25</sub> - value of 10 kΩ has a value of 32.56 kΩ between - 1.17 and + 1.17 °C.

| PARAMETER FOR DETERMINING NOMINAL RESISTANCE VALUES |                        |                                    |                |           |          |                     |                     |                |                                   |                                   |                                   |
|---|------------------------|------------------------------------|----------------|-----------|----------|---------------------|---------------------|----------------|-----------------------------------|-----------------------------------|-----------------------------------|
| NUMBER  | B <sub>25/85</sub> (K) | NAME                               | TOL. B VALUE % | A         | B (K)    | C (K <sup>2</sup> ) | D (K <sup>3</sup> ) | A <sub>1</sub> | B <sub>1</sub> (K <sup>-1</sup> ) | C <sub>1</sub> (K <sup>-2</sup> ) | D <sub>1</sub> (K <sup>-3</sup> ) |
| 1   | 2880                   | Mat O. with B <sub>n</sub> = 2880K | 3              | - 9.094   | 2251.74  | 229098              | - 2.744820E+07      | 3.354016E-03   | 3.495020E-04                      | 2.095959E-06                      | 4.260615E-07                      |
| 2   | 2990                   | Mat P. with B <sub>n</sub> = 3990K | 3              | - 10.2296 | 2887.62  | 132336              | - 2.502510E+07      | 3.354016E-03   | 3.415560E-04                      | 4.955455E-06                      | 4.364236E-07                      |
| 3   | 3041                   | Mat Q. with B <sub>n</sub> = 3041K | 3              | - 11.1334 | 3658.73  | - 102895            | 5.166520E+05        | 3.354016E-03   | 3.349290E-04                      | 3.683843E-06                      | 7.050455E-07                      |
| 4   | 3136                   | Mat R. with B <sub>n</sub> = 3136K | 3              | - 12.4493 | 4702.74  | - 402687            | 3.196830E+07        | 3.354016E-03   | 3.243880E-04                      | 2.658012E-06                      | - 2.701560E-07                    |
| 5   | 3390                   | Mat S. with B <sub>n</sub> = 3390K | 3              | - 12.6814 | 4391.97  | - 232807            | 1.509643E+07        | 3.354016E-03   | 2.993410E-04                      | 2.135133E-06                      | - 5.672000E-09                    |
| 6   | 3528 <sup>(1)</sup>    | Mat I. with B <sub>n</sub> = 3528K | 0.5            | - 12.0596 | 3687.667 | - 7617.13           | - 5.914730E+06      | 3.354016E-03   | 2.909670E-04                      | 1.632136E-06                      | 7.192200E-08                      |
|   | 3528 <sup>(2)</sup>    |                                    |                | - 21.0704 | 11903.95 | - 2504699           | 2.470338E+08        | 3.354016E-03   | 2.933908E-04                      | 3.494314E-06                      | - 7.712690E-07                    |
| 7   | 3560                   | Mat H. with B <sub>n</sub> = 3560K | 1.5            | - 13.0723 | 4190.574 | - 47158.4           | - 1.199256E+07      | 3.354016E-03   | 2.884193E-04                      | 4.118032E-06                      | 1.786790E-07                      |
| 8   | 3740                   | Mat B. with B <sub>n</sub> = 3740K | 2              | - 13.8973 | 4557.725 | - 98275             | - 7.522357E+06      | 3.354016E-03   | 2.744032E-04                      | 3.666944E-06                      | 1.375492E-07                      |
| 9   | 3977                   | Mat A. with B <sub>n</sub> = 3977K | 0.75           | - 14.6337 | 4791.842 | - 115334            | - 3.730535E+06      | 3.354016E-03   | 2.569850E-04                      | 2.620131E-06                      | 6.383091E-08                      |
| 10  | 4090                   | Mat C. with B <sub>n</sub> = 4090K | 1.5            | - 15.5322 | 5229.973 | - 160451            | - 5.414091E+06      | 3.354016E-03   | 2.519107E-04                      | 3.510939E-06                      | 1.105179E-07                      |
| 11  | 4190                   | Mat D. with B <sub>n</sub> = 4190K | 1.5            | - 16.0349 | 5459.339 | - 191141            | - 3.328322E+06      | 3.354016E-03   | 2.460382E-04                      | 3.405377E-06                      | 1.034240E-07                      |
| 12  | 4370                   | Mat E. with B <sub>n</sub> = 4370K | 2.5            | - 16.8717 | 5759.15  | - 194267            | - 6.869149E+06      | 3.354016E-03   | 2.367720E-04                      | 3.585140E-06                      | 1.255349E-07                      |
| 13  | 4570                   | Mat F. with B <sub>n</sub> = 4570K | 1.5            | - 17.6439 | 6022.726 | - 203157            | - 7.183526E+06      | 3.354016E-03   | 2.264097E-04                      | 3.278184E-06                      | 1.097628E-07                      |

**Notes**

- <sup>(1)</sup> Temperature < 25 °C
- <sup>(2)</sup> Temperature ≥ 25 °C



# 2381 640 3/4/6..../NTCLE100E3...B0/T1/T2

NTC Thermistors, Radial Leaded, Vishay BCcomponents  
Standard Precision

For complete Curve Computation, visit: [www.vishay.com/thermistors/curve-computation-list/](http://www.vishay.com/thermistors/curve-computation-list/)

| <b>RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH <math>R_{25}</math> AT 3.3, 4.7 AND 6.8 <math>\Omega</math></b> |  |  |  |              |                                       |
|--|--|--|--|--------------|---------------------------------------|
| $T_{oper}$<br>[°C]   | PART NR.<br>2381 640 **338<br>NTCLE100E3338*** | PART NR.<br>2381 640 **478<br>NTCLE100E3478*** | PART NR.<br>2381 640 **688<br>NTCLE100E3688*** | TCR<br>[%/K] | $\Delta R/R$ DUE TO $B_{tol.}$<br>[%] |
|  | $R_T$<br>[ $\Omega$ ]                          | $R_T$<br>[ $\Omega$ ]                          | $R_T$<br>[ $\Omega$ ]                          |              |                                       |
| - 40   | 45.00  | 64.09  | 92.73  | - 4.97       | 8.08                                  |
| - 35   | 35.25  | 50.20  | 72.63  | - 4.80       | 7.30                                  |
| - 30   | 27.84  | 39.64  | 57.36  | - 4.64       | 6.55                                  |
| - 25   | 22.16  | 31.56  | 45.66  | - 4.48       | 5.84                                  |
| - 20   | 17.78  | 25.32  | 36.63  | - 4.33       | 5.15                                  |
| - 15   | 14.37  | 20.46  | 29.60  | - 4.19       | 4.49                                  |
| - 10   | 11.69  | 16.65  | 24.09  | - 4.05       | 3.85                                  |
| - 5  | 9.582  | 13.65  | 19.74  | - 3.92       | 3.24                                  |
| 0  | 7.904  | 11.26  | 16.29  | - 3.79       | 2.65                                  |
| 5  | 6.560  | 9.344  | 13.52  | - 3.66       | 2.08                                  |
| 10   | 5.479  | 7.803  | 11.29  | - 3.55       | 1.54                                  |
| 15   | 4.602  | 6.554  | 9.482  | - 3.43       | 1.01                                  |
| 20   | 3.886  | 5.535  | 8.008  | - 3.32       | 0.49                                  |
| 25   | 3.300  | 4.700  | 6.800  | - 3.22       | 0.00                                  |
| 30   | 2.816  | 4.011  | 5.803  | - 3.12       | 0.48                                  |
| 35   | 2.415  | 3.440  | 4.977  | - 3.02       | 0.94                                  |
| 40   | 2.081  | 2.964  | 4.289  | - 2.93       | 1.39                                  |
| 45   | 1.801  | 2.566  | 3.712  | - 2.84       | 1.82                                  |
| 50   | 1.566  | 2.230  | 3.227  | - 2.76       | 2.24                                  |
| 55   | 1.367  | 1.947  | 2.817  | - 2.68       | 2.65                                  |
| 60   | 1.198  | 1.706  | 2.469  | - 2.60       | 3.04                                  |
| 65   | 1.054  | 1.501  | 2.172  | - 2.52       | 3.43                                  |
| 70   | 0.9308   | 1.326  | 1.918  | - 2.45       | 3.80                                  |
| 75   | 0.8248   | 1.175  | 1.700  | - 2.38       | 4.16                                  |
| 80   | 0.7334   | 1.044  | 1.511  | - 2.32       | 4.51                                  |
| 85   | 0.6542   | 0.9318   | 1.348  | - 2.25       | 4.85                                  |
| 90   | 0.5854   | 0.8338   | 1.206  | - 2.19       | 5.19                                  |
| 95   | 0.5255   | 0.7484   | 1.083  | - 2.13       | 5.51                                  |
| 100  | 0.4730   | 0.6737   | 0.9748   | - 2.07       | 5.82                                  |
| 105  | 0.4270   | 0.6082   | 0.8799   | - 2.02       | 6.13                                  |
| 110  | 0.3865   | 0.5505   | 0.7965   | - 1.97       | 6.43                                  |
| 115  | 0.3508   | 0.4996   | 0.7228   | - 1.92       | 6.72                                  |
| 120  | 0.3192   | 0.4545   | 0.6576   | - 1.87       | 7.00                                  |
| 125  | 0.2911   | 0.4145   | 0.5998   | - 1.82       | 7.28                                  |
| 130  | 0.2661   | 0.3789   | 0.5483   | - 1.77       | 7.55                                  |
| 135  | 0.2438   | 0.3472   | 0.5023   | - 1.73       | 7.81                                  |
| 140  | 0.2238   | 0.3188   | 0.4612   | - 1.69       | 8.07                                  |
| 145  | 0.2059   | 0.2933   | 0.4244   | - 1.65       | 8.32                                  |
| 150  | 0.1899   | 0.2704   | 0.3912   | - 1.61       | 8.56                                  |

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| <b>RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH <math>R_{25}</math> AT 10, 15 AND 22 <math>\Omega</math></b> |  |              |  |  |              |  |  |              |  |
|---|--|--------------|--|--|--------------|--|--|--------------|--|
| $T_{oper}$<br>[°C]  | PART NR.<br>2381 640 **109<br>NTCLE100E3109*** |              |  | PART NR.<br>2381 640 **159<br>NTCLE100E3159*** |              |  | PART NR.<br>2381 640 **229<br>NTCLE100E3229*** |              |  |
|   | $R_T$<br>[ $\Omega$ ]                          | TCR<br>[%/K] | $\Delta R/R$ DUE<br>TO $B_{tol.}$<br>[%] | $R_T$<br>[ $\Omega$ ]                          | TCR<br>[%/K] | $\Delta R/R$ DUE<br>TO $B_{tol.}$<br>[%] | $R_T$<br>[ $\Omega$ ]                          | TCR<br>[%/K] | $\Delta R/R$ DUE<br>TO $B_{tol.}$<br>[%] |
| -40   | 136.7  | -4.86        | 8.39                                     | 224.8  | -5.16        | 8.65                                     | 374.9  | -5.54        | 8.80                                     |
| -35   | 107.6  | -4.72        | 7.58                                     | 174.5  | -4.98        | 7.79                                     | 285.8  | -5.31        | 7.95                                     |
| -30   | 85.32  | -4.58        | 6.81                                     | 136.6  | -4.80        | 6.98                                     | 220.4  | -5.10        | 7.14                                     |
| -25   | 68.10  | -4.44        | 6.06                                     | 107.9  | -4.64        | 6.21                                     | 171.7  | -4.90        | 6.36                                     |
| -20   | 54.72  | -4.31        | 5.35                                     | 85.94  | -4.48        | 5.47                                     | 135.0  | -4.71        | 5.61                                     |
| -15   | 44.25  | -4.18        | 4.66                                     | 68.96  | -4.33        | 4.76                                     | 107.2  | -4.53        | 4.89                                     |
| -10   | 36.02  | -4.06        | 4.00                                     | 55.74  | -4.19        | 4.08                                     | 85.79  | -4.37        | 4.20                                     |
| -5  | 29.49  | -3.94        | 3.37                                     | 45.37  | -4.05        | 3.43                                     | 69.21  | -4.22        | 3.53                                     |
| 0   | 24.30  | -3.82        | 2.75                                     | 37.17  | -3.92        | 2.81                                     | 56.26  | -4.07        | 2.89                                     |
| 5   | 20.13  | -3.71        | 2.16                                     | 30.65  | -3.80        | 2.20                                     | 46.05  | -3.94        | 2.27                                     |
| 10  | 16.77  | -3.60        | 1.59                                     | 25.42  | -3.68        | 1.62                                     | 37.94  | -3.81        | 1.67                                     |
| 15  | 14.04  | -3.50        | 1.04                                     | 21.21  | -3.57        | 1.06                                     | 31.45  | -3.69        | 1.10                                     |
| 20  | 11.82  | -3.39        | 0.51                                     | 17.79  | -3.46        | 0.52                                     | 26.23  | -3.57        | 0.54                                     |
| 25  | 10.00  | -3.30        | 0.00                                     | 15.00  | -3.36        | 0.00                                     | 22.00  | -3.47        | 0.00                                     |
| 30  | 8.500  | -3.20        | 0.50                                     | 12.76  | -3.26        | 0.49                                     | 18.55  | -3.36        | 0.52                                     |
| 35  | 7.259  | -3.11        | 0.98                                     | 10.86  | -3.17        | 0.98                                     | 15.72  | -3.26        | 1.02                                     |
| 40  | 6.226  | -3.03        | 1.44                                     | 9.291  | -3.08        | 1.46                                     | 13.38  | -3.17        | 1.51                                     |
| 45  | 5.363  | -2.94        | 1.89                                     | 7.982  | -2.99        | 1.92                                     | 11.45  | -3.08        | 1.98                                     |
| 50  | 4.639  | -2.86        | 2.33                                     | 6.887  | -2.91        | 2.36                                     | 9.833  | -3.00        | 2.44                                     |
| 55  | 4.029  | -2.78        | 2.75                                     | 5.966  | -2.83        | 2.79                                     | 8.482  | -2.92        | 2.88                                     |
| 60  | 3.512  | -2.71        | 3.16                                     | 5.189  | -2.75        | 3.21                                     | 7.346  | -2.84        | 3.32                                     |
| 65  | 3.073  | -2.64        | 3.56                                     | 4.529  | -2.68        | 3.62                                     | 6.386  | -2.76        | 3.73                                     |
| 70  | 2.698  | -2.57        | 3.95                                     | 3.968  | -2.61        | 4.02                                     | 5.572  | -2.69        | 4.14                                     |
| 75  | 2.377  | -2.50        | 4.32                                     | 3.488  | -2.54        | 4.41                                     | 4.879  | -2.62        | 4.53                                     |
| 80  | 2.101  | -2.43        | 4.69                                     | 3.077  | -2.48        | 4.78                                     | 4.286  | -2.56        | 4.91                                     |
| 85  | 1.864  | -2.37        | 5.04                                     | 2.722  | -2.41        | 5.15                                     | 3.777  | -2.50        | 5.29                                     |
| 90  | 1.658  | -2.31        | 5.38                                     | 2.416  | -2.35        | 5.51                                     | 3.339  | -2.44        | 5.65                                     |
| 95  | 1.479  | -2.25        | 5.72                                     | 2.151  | -2.30        | 5.85                                     | 2.960  | -2.38        | 6.00                                     |
| 100   | 1.323  | -2.20        | 6.05                                     | 1.920  | -2.24        | 6.19                                     | 2.632  | -2.32        | 6.34                                     |
| 105   | 1.187  | -2.14        | 6.36                                     | 1.719  | -2.19        | 6.53                                     | 2.347  | -2.27        | 6.68                                     |
| 110   | 1.068  | -2.09        | 6.67                                     | 1.543  | -2.13        | 6.85                                     | 2.098  | -2.22        | 7.00                                     |
| 115   | 0.9635   | -2.04        | 6.98                                     | 1.389  | -2.08        | 7.17                                     | 1.880  | -2.17        | 7.32                                     |
| 120   | 0.8712   | -1.99        | 7.27                                     | 1.253  | -2.03        | 7.48                                     | 1.689  | -2.12        | 7.62                                     |
| 125   | 0.7897   | -1.94        | 7.56                                     | 1.133  | -1.99        | 7.78                                     | 1.521  | -2.07        | 7.93                                     |
| 130   | 0.7174   | -1.90        | 7.84                                     | 1.027  | -1.94        | 8.08                                     | 1.373  | -2.03        | 8.22                                     |
| 135   | 0.6533   | -1.85        | 8.11                                     | 0.9326   | -1.90        | 8.37                                     | 1.242  | -1.98        | 8.50                                     |
| 140   | 0.5961   | -1.81        | 8.37                                     | 0.8490   | -1.86        | 8.65                                     | 1.126  | -1.94        | 8.78                                     |
| 145   | 0.5451   | -1.77        | 8.63                                     | 0.7744   | -1.82        | 8.93                                     | 1.023  | -1.90        | 9.06                                     |
| 150   | 0.4995   | -1.73        | 8.89                                     | 0.7079   | -1.78        | 9.20                                     | 0.9309   | -1.86        | 9.32                                     |



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| <b>RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH <math>R_{25}</math> AT 33, 47 AND 68 <math>\Omega</math></b> |  |  |  |              |                                       |
|---|--|--|--|--------------|---------------------------------------|
| $T_{oper}$<br>[°C]  | PART NR.<br>2381 640 **339<br>NTCLE100E3339*** | PART NR.<br>2381 640 **479<br>NTCLE100E3479*** | PART NR.<br>2381 640 **689<br>NTCLE100E3689*** | TCR<br>[%/K] | $\Delta R/R$ DUE TO $B_{tol.}$<br>[%] |
|   | $R_T$<br>[ $\Omega$ ]                          | $R_T$<br>[ $\Omega$ ]                          | $R_T$<br>[ $\Omega$ ]                          |              |                                       |
| - 40  | 707.0  | 1007   | 1457   | - 5.94       | 9.30                                  |
| - 35  | 528.5  | 752.7  | 1089   | - 5.70       | 8.44                                  |
| - 30  | 399.5  | 569.0  | 823.3  | - 5.49       | 7.60                                  |
| - 25  | 305.3  | 434.8  | 629.1  | - 5.28       | 6.79                                  |
| - 20  | 235.6  | 335.6  | 485.5  | - 5.09       | 6.01                                  |
| - 15  | 183.5  | 261.4  | 378.2  | - 4.90       | 5.25                                  |
| - 10  | 144.3  | 205.5  | 297.3  | - 4.73       | 4.51                                  |
| - 5   | 114.3  | 162.8  | 235.6  | - 4.57       | 3.80                                  |
| 0   | 91.34  | 130.1  | 188.2  | - 4.42       | 3.11                                  |
| 5   | 73.51  | 104.7  | 151.5  | - 4.27       | 2.45                                  |
| 10  | 59.59  | 84.87  | 122.8  | - 4.13       | 1.80                                  |
| 15  | 48.63  | 69.26  | 100.2  | - 4.00       | 1.18                                  |
| 20  | 39.94  | 56.88  | 82.29  | - 3.88       | 0.58                                  |
| 25  | 33.00  | 47.00  | 68.00  | - 3.76       | 0.00                                  |
| 30  | 27.43  | 39.06  | 56.51  | - 3.64       | 0.56                                  |
| 35  | 22.92  | 32.64  | 47.23  | - 3.54       | 1.11                                  |
| 40  | 19.26  | 27.42  | 39.68  | - 3.43       | 1.63                                  |
| 45  | 16.26  | 23.16  | 33.50  | - 3.34       | 2.14                                  |
| 50  | 13.79  | 19.65  | 28.42  | - 3.24       | 2.63                                  |
| 55  | 11.76  | 16.74  | 24.23  | - 3.15       | 3.11                                  |
| 60  | 10.06  | 14.33  | 20.74  | - 3.07       | 3.57                                  |
| 65  | 8.652  | 12.32  | 17.83  | - 2.98       | 4.02                                  |
| 70  | 7.468  | 10.64  | 15.39  | - 2.90       | 4.45                                  |
| 75  | 6.471  | 9.216  | 13.33  | - 2.83       | 4.87                                  |
| 80  | 5.628  | 8.015  | 11.60  | - 2.76       | 5.27                                  |
| 85  | 4.912  | 6.996  | 10.12  | - 2.69       | 5.66                                  |
| 90  | 4.302  | 6.127  | 8.865  | - 2.62       | 6.04                                  |
| 95  | 3.780  | 5.384  | 7.790  | - 2.55       | 6.41                                  |
| 100   | 3.332  | 4.746  | 6.867  | - 2.49       | 6.77                                  |
| 105   | 2.946  | 4.196  | 6.071  | - 2.43       | 7.11                                  |
| 110   | 2.613  | 3.721  | 5.384  | - 2.37       | 7.45                                  |
| 115   | 2.324  | 3.310  | 4.788  | - 2.32       | 7.77                                  |
| 120   | 2.072  | 2.951  | 4.270  | - 2.26       | 8.09                                  |
| 125   | 1.853  | 2.639  | 3.818  | - 2.21       | 8.39                                  |
| 130   | 1.661  | 2.365  | 3.422  | - 2.16       | 8.69                                  |
| 135   | 1.492  | 2.125  | 3.075  | - 2.11       | 8.97                                  |
| 140   | 1.344  | 1.914  | 2.770  | - 2.07       | 9.25                                  |
| 145   | 1.213  | 1.728  | 2.500  | - 2.02       | 9.52                                  |
| 150   | 1.098  | 1.564  | 2.262  | - 1.98       | 9.79                                  |

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| RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH $R_{25}$ AT 100, 150, 220, 330, 470 AND 680 $\Omega$ |  |  |  |  |  |  |              |  |
|--|--|--|--|--|--|--|--------------|--|
| $T_{oper}$<br>[°C]   | PART NR.<br>2381 640 **101<br>NTCLE100E3101*** | PART NR.<br>2381 640 **151<br>NTCLE100E3151*** | PART NR.<br>2381 640 **221<br>NTCLE100E3221*** | PART NR.<br>2381 640 **331<br>NTCLE100E3331*** | PART NR.<br>2381 640 **471<br>NTCLE100E3471*** | PART NR.<br>2381 640 **681<br>NTCLE100E3681*** | TCR<br>[%/K] | $\Delta R/R$<br>DUE<br>TO<br>$B_{tot.}$<br>[%] |
|  | $R_T$<br>[ $\Omega$ ]                          | $R_T$<br>[ $\Omega$ ]                          | $R_T$<br>[ $\Omega$ ]                          | $R_T$<br>[ $\Omega$ ]                          | $R_T$<br>[ $\Omega$ ]                          | $R_T$<br>[ $\Omega$ ]                          |              |  |
| -40  | 2193   | 3289   | 4824   | 7236   | 10 305   | 14 910   | -5.75        | 4.99   |
| -35  | 1652   | 2478   | 3635   | 5452   | 7766   | 11 235   | -5.57        | 4.51   |
| -30  | 1256   | 1884   | 2763   | 4144   | 5902   | 8540   | -5.40        | 4.05   |
| -25  | 962.5  | 1444   | 2117   | 3176   | 4524   | 6545   | -5.24        | 3.61   |
| -20  | 743.6  | 1115   | 1636   | 2454   | 3495   | 5057   | -5.08        | 3.19   |
| -15  | 579.0  | 868.5  | 1274   | 1911   | 2721   | 3937   | -4.93        | 2.78   |
| -10  | 454.2  | 681.2  | 999.1  | 1499   | 2135   | 3088   | -4.78        | 2.38   |
| -5   | 358.8  | 538.2  | 789.4  | 1184   | 1686   | 2440   | -4.64        | 2.01   |
| 0  | 285.4  | 428.2  | 628.0  | 942.0  | 1342   | 1941   | -4.51        | 1.64   |
| 5  | 228.6  | 342.9  | 502.9  | 754.4  | 1074   | 1554   | -4.38        | 1.29   |
| 10   | 184.2  | 276.4  | 405.3  | 608.0  | 866.0  | 1253   | -4.25        | 0.95   |
| 15   | 149.4  | 224.1  | 328.7  | 493.1  | 702.2  | 1016   | -4.13        | 0.62   |
| 20   | 121.9  | 182.8  | 268.2  | 402.2  | 572.9  | 828.8  | -4.01        | 0.31   |
| 25   | 100.0  | 150.0  | 220.0  | 330.0  | 470.0  | 680.0  | -3.90        | 0.00   |
| 30   | 82.49  | 123.7  | 181.5  | 272.2  | 387.7  | 561.0  | -3.80        | 0.30   |
| 35   | 68.41  | 102.6  | 150.5  | 225.8  | 321.5  | 465.2  | -3.69        | 0.58   |
| 40   | 57.02  | 85.54  | 125.5  | 188.2  | 268.0  | 387.8  | -3.59        | 0.86   |
| 45   | 47.77  | 71.65  | 105.1  | 157.6  | 224.5  | 324.8  | -3.50        | 1.13   |
| 50   | 40.20  | 60.30  | 88.44  | 132.7  | 188.9  | 273.3  | -3.40        | 1.39   |
| 55   | 33.98  | 50.98  | 74.76  | 112.1  | 159.7  | 231.1  | -3.31        | 1.64   |
| 60   | 28.86  | 43.28  | 63.48  | 95.23  | 135.6  | 196.2  | -3.23        | 1.88   |
| 65   | 24.61  | 36.91  | 54.13  | 81.20  | 115.6  | 167.3  | -3.15        | 2.12   |
| 70   | 21.07  | 31.60  | 46.35  | 69.52  | 99.01  | 143.3  | -3.07        | 2.35   |
| 75   | 18.11  | 27.16  | 39.84  | 59.76  | 85.11  | 123.1  | -2.99        | 2.57   |
| 80   | 15.62  | 23.43  | 34.37  | 51.56  | 73.43  | 106.2  | -2.91        | 2.79   |
| 85   | 13.53  | 20.29  | 29.76  | 44.65  | 63.59  | 92.00  | -2.84        | 3.00   |
| 90   | 11.76  | 17.63  | 25.86  | 38.80  | 55.26  | 79.95  | -2.77        | 3.21   |
| 95   | 10.25  | 15.38  | 22.55  | 33.83  | 48.18  | 69.71  | -2.71        | 3.41   |
| 100  | 8.968  | 13.45  | 19.73  | 29.59  | 42.15  | 60.98  | -2.64        | 3.60   |
| 105  | 7.871  | 11.81  | 17.32  | 25.97  | 36.99  | 53.52  | -2.58        | 3.79   |
| 110  | 6.928  | 10.39  | 15.24  | 22.86  | 32.56  | 47.11  | -2.52        | 3.97   |
| 115  | 6.117  | 9.176  | 13.46  | 20.19  | 28.75  | 41.60  | -2.46        | 4.15   |
| 120  | 5.416  | 8.125  | 11.92  | 17.87  | 25.46  | 36.83  | -2.41        | 4.33   |
| 125  | 4.809  | 7.214  | 10.58  | 15.87  | 22.60  | 32.70  | -2.35        | 4.50   |
| 130  | 4.282  | 6.422  | 9.419  | 14.13  | 20.12  | 29.11  | -2.30        | 4.66   |
| 135  | 3.822  | 5.732  | 8.408  | 12.61  | 17.96  | 25.99  | -2.25        | 4.83   |
| 140  | 3.420  | 5.130  | 7.523  | 11.29  | 16.07  | 23.25  | -2.20        | 4.99   |
| 145  | 3.068  | 4.601  | 6.749  | 10.12  | 14.42  | 20.86  | -2.15        | 5.14   |
| 150  | 2.758  | 4.137  | 6.068  | 9.102  | 12.96  | 18.76  | -2.10        | 5.29   |





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| <b>RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH <math>R_{25}</math> AT 1, 1.5 AND 2 k<math>\Omega</math></b> |  |  |  |              |                                       |
|---|--|--|--|--------------|---------------------------------------|
| $T_{oper}$<br>[°C]  | PART NR.<br>2381 640 **102<br>NTCLE100E3102*** | PART NR.<br>2381 640 **152<br>NTCLE100E3152*** | PART NR.<br>2381 640 **202<br>NTCLE100E3202*** | TCR<br>[%/K] | $\Delta R/R$ DUE TO $B_{tol.}$<br>[%] |
|   | $R_T$<br>[ $\Omega$ ]                          | $R_T$<br>[ $\Omega$ ]                          | $R_T$<br>[ $\Omega$ ]                          |              |                                       |
| - 40  | 23 342   | 35 013   | 46 684   | - 6.06       | 1.65                                  |
| - 35  | 17 336   | 26 004   | 34 672   | - 5.84       | 1.49                                  |
| - 30  | 13 018   | 19 526   | 26 035   | - 5.62       | 1.34                                  |
| - 25  | 9877   | 14 816   | 19 754   | - 5.42       | 1.19                                  |
| - 20  | 7569   | 11 353   | 15 138   | - 5.23       | 1.05                                  |
| - 15  | 5855   | 8782   | 11 709   | - 5.05       | 0.92                                  |
| - 10  | 4569   | 6854   | 9138   | - 4.87       | 0.79                                  |
| - 5   | 3596   | 5395   | 7193   | - 4.71       | 0.66                                  |
| 0   | 2854   | 4280   | 5707   | - 4.55       | 0.54                                  |
| 5   | 2282   | 3422   | 4563   | - 4.40       | 0.43                                  |
| 10  | 1838   | 2757   | 3675   | - 4.26       | 0.31                                  |
| 15  | 1491   | 2236   | 2981   | - 4.12       | 0.21                                  |
| 20  | 1217   | 1826   | 2434   | - 3.99       | 0.10                                  |
| 25  | 1000   | 1500   | 2000   | - 3.87       | 0.00                                  |
| 30  | 826.6  | 1240   | 1653   | - 3.75       | 0.10                                  |
| 35  | 687.3  | 1031   | 1375   | - 3.63       | 0.19                                  |
| 40  | 574.6  | 861.9  | 1149   | - 3.53       | 0.28                                  |
| 45  | 482.7  | 724.0  | 965.4  | - 3.42       | 0.37                                  |
| 50  | 407.4  | 611.0  | 814.7  | - 3.32       | 0.46                                  |
| 55  | 345.2  | 517.8  | 690.5  | - 3.23       | 0.54                                  |
| 60  | 293.7  | 440.6  | 587.4  | - 3.14       | 0.62                                  |
| 65  | 250.8  | 376.2  | 501.6  | - 3.05       | 0.70                                  |
| 70  | 214.9  | 322.4  | 429.8  | - 2.97       | 0.78                                  |
| 75  | 184.7  | 277.1  | 369.5  | - 2.89       | 0.86                                  |
| 80  | 159.3  | 238.9  | 318.6  | - 2.81       | 0.93                                  |
| 85  | 137.7  | 206.6  | 275.5  | - 2.73       | 1.01                                  |
| 90  | 119.4  | 179.1  | 238.8  | - 2.66       | 1.08                                  |
| 95  | 103.8  | 155.7  | 207.6  | - 2.59       | 1.15                                  |
| 100   | 90.45  | 135.7  | 180.9  | - 2.53       | 1.22                                  |
| 105   | 79.00  | 118.5  | 158.0  | - 2.46       | 1.29                                  |
| 110   | 69.15  | 103.7  | 138.3  | - 2.40       | 1.35                                  |
| 115   | 60.66  | 90.99  | 121.3  | - 2.34       | 1.42                                  |
| 120   | 53.32  | 79.98  | 106.6  | - 2.29       | 1.48                                  |
| 125   | 46.96  | 70.44  | 93.92  | - 2.23       | 1.55                                  |
| 130   | 41.43  | 62.15  | 82.87  | - 2.18       | 1.61                                  |
| 135   | 36.63  | 54.94  | 73.25  | - 2.13       | 1.67                                  |
| 140   | 32.43  | 48.65  | 64.87  | - 2.08       | 1.73                                  |
| 145   | 28.77  | 43.16  | 57.54  | - 2.03       | 1.79                                  |
| 150   | 25.56  | 38.34  | 51.12  | - 1.98       | 1.85                                  |

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| <b>RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R<sub>25</sub> AT 2.2, 2.7, 3.3, 4.7, 5.0, 6.8 AND 10 kΩ</b> |                            |                            |                            |                            |                            |                            |                            |              |   |
|---|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|--------------|---|
| T <sub>oper</sub><br>[°C]   | PART NR.<br>2381 640 **222 | PART NR.<br>2381 640 **272 | PART NR.<br>2381 640 **332 | PART NR.<br>2381 640 **472 | PART NR.<br>2381 640 **502 | PART NR.<br>2381 640 **682 | PART NR.<br>2381 640 **103 | TCR<br>[%/K] | ΔR/R<br>DUE<br>TO<br>B <sub>tol.</sub><br>[%] |
|   | NTCLE100E3222***           | NTCLE100E3272***           | NTCLE100E3332***           | NTCLE100E3472***           | NTCLE100E3502***           | NTCLE100E3682***           | NTCLE100E3103***           |              |   |
|   | R <sub>T</sub><br>[Ω]      | R <sub>T</sub><br>[Ω]      | R <sub>T</sub><br>[Ω]      | R <sub>T</sub><br>[Ω]      | R <sub>T</sub><br>[Ω]      | R <sub>T</sub><br>[Ω]      | R <sub>T</sub><br>[Ω]      |              |   |
| -40   | 73 061                     | 89 665                     | 109 591                    | 156 084                    | 166 047                    | 225 824                    | 332 094                    | -6.62        | 2.79  |
| -35   | 52 778                     | 64 773                     | 79 167                     | 112 753                    | 119 950                    | 163 132                    | 239 900                    | -6.39        | 2.52  |
| -30   | 38 544                     | 47 304                     | 57 816                     | 82 344                     | 87 600                     | 119 136                    | 175 200                    | -6.18        | 2.26  |
| -25   | 28 443                     | 34 907                     | 42 665                     | 60 765                     | 64 643                     | 87 915                     | 129 287                    | -5.98        | 2.02  |
| -20   | 21 199                     | 26 017                     | 31 798                     | 45 288                     | 48 179                     | 65 524                     | 96 358                     | -5.78        | 1.78  |
| -15   | 15 950                     | 19 575                     | 23 925                     | 34 075                     | 36 250                     | 49 300                     | 72 500                     | -5.60        | 1.55  |
| -10   | 12 110                     | 14 862                     | 18 165                     | 25 872                     | 27 523                     | 37 431                     | 55 046                     | -5.42        | 1.33  |
| -5  | 9275                       | 11 382                     | 13 912                     | 19 814                     | 21 078                     | 28 667                     | 42 157                     | -5.25        | 1.12  |
| 0   | 7162                       | 8790                       | 10 743                     | 15 300                     | 16 277                     | 22 137                     | 32 554                     | -5.09        | 0.92  |
| 5   | 5574                       | 6841                       | 8362                       | 11 909                     | 12 669                     | 17 230                     | 25 339                     | -4.93        | 0.72  |
| 10  | 4372                       | 5365                       | 6558                       | 9340                       | 9936                       | 13 513                     | 19 872                     | -4.79        | 0.53  |
| 15  | 3454                       | 4239                       | 5180                       | 7378                       | 7849                       | 10 675                     | 15 698                     | -4.64        | 0.35  |
| 20  | 2747                       | 3372                       | 4121                       | 5869                       | 6244                       | 8492                       | 12 488                     | -4.51        | 0.17  |
| 25  | 2200                       | 2700                       | 3300                       | 4700                       | 5000                       | 6800                       | 10 000                     | -4.38        | 0.00  |
| 30  | 1773                       | 2176                       | 2659                       | 3788                       | 4030                       | 5480                       | 8059                       | -4.25        | 0.17  |
| 35  | 1438                       | 1764                       | 2156                       | 3071                       | 3267                       | 4444                       | 6535                       | -4.13        | 0.32  |
| 40  | 1173                       | 1439                       | 1759                       | 2505                       | 2665                       | 3624                       | 5330                       | -4.02        | 0.48  |
| 45  | 961.8                      | 1180                       | 1443                       | 2055                       | 2186                       | 2973                       | 4372                       | -3.91        | 0.63  |
| 50  | 793.2                      | 973.4                      | 1190                       | 1694                       | 1803                       | 2452                       | 3605                       | -3.80        | 0.77  |
| 55  | 657.5                      | 806.9                      | 986.3                      | 1405                       | 1494                       | 2032                       | 2989                       | -3.70        | 0.91  |
| 60  | 547.8                      | 672.3                      | 821.7                      | 1170                       | 1245                       | 1693                       | 2490                       | -3.60        | 1.05  |
| 65  | 458.6                      | 562.8                      | 687.9                      | 979.7                      | 1042                       | 1417                       | 2084                       | -3.51        | 1.18  |
| 70  | 385.7                      | 473.3                      | 578.5                      | 823.9                      | 876.5                      | 1192                       | 1753                       | -3.42        | 1.31  |
| 75  | 325.8                      | 399.8                      | 488.7                      | 696.0                      | 740.5                      | 1007                       | 1481                       | -3.33        | 1.44  |
| 80  | 276.4                      | 339.2                      | 414.6                      | 590.5                      | 628.2                      | 854.3                      | 1256                       | -3.25        | 1.56  |
| 85  | 235.5                      | 289.0                      | 353.2                      | 503.0                      | 535.2                      | 727.8                      | 1070                       | -3.17        | 1.68  |
| 90  | 201.4                      | 247.2                      | 302.1                      | 430.2                      | 457.7                      | 622.5                      | 915.4                      | -3.09        | 1.79  |
| 95  | 172.9                      | 212.2                      | 259.4                      | 369.4                      | 393.0                      | 534.5                      | 786.0                      | -3.01        | 1.90  |
| 100   | 149.0                      | 182.9                      | 223.5                      | 318.3                      | 338.6                      | 460.6                      | 677.3                      | -2.94        | 2.01  |
| 105   | 128.9                      | 158.2                      | 193.3                      | 275.3                      | 292.9                      | 398.3                      | 585.7                      | -2.87        | 2.12  |
| 110   | 111.8                      | 137.2                      | 167.7                      | 238.9                      | 254.2                      | 345.7                      | 508.3                      | -2.80        | 2.22  |
| 115   | 97.37                      | 119.5                      | 146.1                      | 208.0                      | 221.3                      | 301.0                      | 442.6                      | -2.74        | 2.32  |
| 120   | 85.05                      | 104.4                      | 127.6                      | 181.7                      | 193.3                      | 262.9                      | 386.6                      | -2.67        | 2.42  |
| 125   | 74.52                      | 91.46                      | 111.8                      | 159.2                      | 169.4                      | 230.3                      | 338.7                      | -2.61        | 2.51  |
| 130   | 65.49                      | 80.38                      | 98.24                      | 139.9                      | 148.8                      | 202.4                      | 297.7                      | -2.55        | 2.61  |
| 135   | 57.72                      | 70.84                      | 86.59                      | 123.3                      | 131.2                      | 178.4                      | 262.4                      | -2.50        | 2.70  |
| 140   | 51.02                      | 62.62                      | 76.53                      | 109.0                      | 116.0                      | 157.7                      | 231.9                      | -2.44        | 2.78  |
| 145   | 45.22                      | 55.49                      | 67.83                      | 96.60                      | 102.8                      | 139.8                      | 205.5                      | -2.39        | 2.87  |
| 150   | 40.18                      | 49.31                      | 60.27                      | 85.84                      | 91.32                      | 124.2                      | 182.6                      | -2.34        | 2.96  |



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| <b>RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R<sub>25</sub> AT 12, 15 AND 22 kΩ</b> |  |  |  |              |                                      |
|---|--|--|--|--------------|--------------------------------------|
| T <sub>oper</sub><br>[°C]   | PART NR.<br>2381 640 **123<br>NTCLE100E3123*** | PART NR.<br>2381 640 **153<br>NTCLE100E3153*** | PART NR.<br>2381 640 **223<br>NTCLE100E3223*** | TCR<br>[%/K] | ΔR/R DUE TO B <sub>tol.</sub><br>[%] |
|   | R <sub>T</sub><br>[kΩ]                         | R <sub>T</sub><br>[kΩ]                         | R <sub>T</sub><br>[kΩ]                         |              |                                      |
| - 40  | 309.4  | 386.7  | 567.2  | - 6.07       | 7.00                                 |
| - 35  | 229.5  | 286.9  | 420.8  | - 5.88       | 6.32                                 |
| - 30  | 171.8  | 214.8  | 315.0  | - 5.70       | 5.68                                 |
| - 25  | 129.8  | 162.3  | 238.0  | - 5.52       | 5.06                                 |
| - 20  | 98.93  | 123.7  | 181.4  | - 5.35       | 4.46                                 |
| - 15  | 76.02  | 95.02  | 139.4  | - 5.19       | 3.89                                 |
| - 10  | 58.88  | 73.60  | 107.9  | - 5.03       | 3.34                                 |
| - 5   | 45.95  | 57.44  | 84.25  | - 4.88       | 2.81                                 |
| 0   | 36.13  | 45.16  | 66.24  | - 4.74       | 2.30                                 |
| 5   | 28.61  | 35.76  | 52.45  | - 4.60       | 1.80                                 |
| 10  | 22.80  | 28.51  | 41.81  | - 4.47       | 1.33                                 |
| 15  | 18.30  | 22.87  | 33.55  | - 4.34       | 0.87                                 |
| 20  | 14.77  | 18.47  | 27.08  | - 4.22       | 0.43                                 |
| 25  | 12.00  | 15.00  | 22.00  | - 4.10       | 0.00                                 |
| 30  | 9.804  | 12.25  | 17.97  | - 3.99       | 0.41                                 |
| 35  | 8.054  | 10.07  | 14.77  | - 3.88       | 0.81                                 |
| 40  | 6.652  | 8.315  | 12.20  | - 3.77       | 1.20                                 |
| 45  | 5.522  | 6.903  | 10.12  | - 3.67       | 1.58                                 |
| 50  | 4.607  | 5.759  | 8.447  | - 3.58       | 1.94                                 |
| 55  | 3.862  | 4.828  | 7.081  | - 3.48       | 2.29                                 |
| 60  | 3.252  | 4.066  | 5.963  | - 3.39       | 2.64                                 |
| 65  | 2.751  | 3.439  | 5.044  | - 3.30       | 2.97                                 |
| 70  | 2.337  | 2.921  | 4.284  | - 3.22       | 3.29                                 |
| 75  | 1.993  | 2.492  | 3.654  | - 3.14       | 3.60                                 |
| 80  | 1.707  | 2.134  | 3.129  | - 3.06       | 3.91                                 |
| 85  | 1.467  | 1.834  | 2.690  | - 2.99       | 4.20                                 |
| 90  | 1.266  | 1.582  | 2.321  | - 2.92       | 4.49                                 |
| 95  | 1.096  | 1.370  | 2.010  | - 2.85       | 4.77                                 |
| 100   | 0.9524   | 1.190  | 1.746  | - 2.78       | 5.04                                 |
| 105   | 0.8302   | 1.038  | 1.522  | - 2.71       | 5.31                                 |
| 110   | 0.7260   | 0.9075   | 1.331  | - 2.65       | 5.56                                 |
| 115   | 0.6369   | 0.7961   | 1.168  | - 2.59       | 5.82                                 |
| 120   | 0.5604   | 0.7005   | 1.027  | - 2.53       | 6.06                                 |
| 125   | 0.4945   | 0.6181   | 0.9065   | - 2.47       | 6.30                                 |
| 130   | 0.4375   | 0.5469   | 0.8022   | - 2.42       | 6.53                                 |
| 135   | 0.3882   | 0.4853   | 0.7117   | - 2.37       | 6.76                                 |
| 140   | 0.3454   | 0.4317   | 0.6332   | - 2.31       | 6.98                                 |
| 145   | 0.3080   | 0.3850   | 0.5647   | - 2.26       | 7.20                                 |
| 150   | 0.2754   | 0.3442   | 0.5049   | - 2.22       | 7.41                                 |

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| <b>RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R<sub>25</sub> AT 33, 47, 50, 68 AND 100 kΩ</b> |                                    |                        |              |   |                        |                        |                        |              |   |
|--|------------------------------------|------------------------|--------------|---|------------------------|------------------------|------------------------|--------------|---|
| T <sub>oper</sub><br>[°C]  | PART NR.<br>2381 640<br>NTCLE100E3 |                        |              |   |                        |                        |                        |              |   |
|  | **333<br>333**                     | **473<br>473**         | TCR<br>[%/K] | ΔR/R DUE<br>TO B <sub>tol.</sub><br>[%] | **503<br>503**         | **683<br>683**         | **104<br>104**         | TCR<br>[%/K] | ΔR/R DUE<br>TO B <sub>tol.</sub><br>[%] |
|  | R <sub>T</sub><br>[kΩ]             | R <sub>T</sub><br>[kΩ] |              |   | R <sub>T</sub><br>[kΩ] | R <sub>T</sub><br>[kΩ] | R <sub>T</sub><br>[kΩ] |              |   |
| - 40   | 1116                               | 1589                   | - 6.54       | 5.74                                    | 1833                   | 2493                   | 3666                   | - 6.69       | 5.88                                    |
| - 35   | 808.6                              | 1152                   | - 6.34       | 5.19                                    | 1319                   | 1794                   | 2638                   | - 6.49       | 5.31                                    |
| - 30   | 591.7                              | 842.8                  | - 6.15       | 4.66                                    | 958.3                  | 1303                   | 1917                   | - 6.29       | 4.77                                    |
| - 25   | 437.1                              | 622.6                  | - 5.96       | 4.15                                    | 703.1                  | 956.2                  | 1406                   | - 6.10       | 4.25                                    |
| - 20   | 325.9                              | 464.1                  | - 5.79       | 3.66                                    | 520.6                  | 708.0                  | 1041                   | - 5.92       | 3.75                                    |
| - 15   | 245.0                              | 349.0                  | - 5.62       | 3.19                                    | 388.9                  | 528.9                  | 777.8                  | - 5.75       | 3.27                                    |
| - 10   | 185.8                              | 264.6                  | - 5.45       | 2.74                                    | 293.0                  | 398.5                  | 586.1                  | - 5.58       | 2.80                                    |
| - 5  | 142.0                              | 202.3                  | - 5.30       | 2.30                                    | 222.6                  | 302.8                  | 445.3                  | - 5.42       | 2.36                                    |
| 0  | 109.4                              | 155.8                  | - 5.14       | 1.88                                    | 170.5                  | 231.8                  | 340.9                  | - 5.26       | 1.93                                    |
| 5  | 84.91                              | 120.9                  | - 5.00       | 1.48                                    | 131.5                  | 178.9                  | 263.1                  | - 5.11       | 1.52                                    |
| 10   | 66.37                              | 94.53                  | - 4.86       | 1.09                                    | 102.2                  | 139.0                  | 204.4                  | - 4.97       | 1.12                                    |
| 15   | 52.24                              | 74.40                  | - 4.72       | 0.71                                    | 80.01                  | 108.8                  | 160.0                  | - 4.83       | 0.73                                    |
| 20   | 41.39                              | 58.95                  | - 4.59       | 0.35                                    | 63.04                  | 85.74                  | 126.1                  | - 4.70       | 0.36                                    |
| 25   | 33.00                              | 47.00                  | - 4.47       | 0.00                                    | 50.00                  | 68.00                  | 100.0                  | - 4.57       | 0.00                                    |
| 30   | 26.47                              | 37.71                  | - 4.35       | 0.34                                    | 39.90                  | 54.27                  | 79.81                  | - 4.45       | 0.35                                    |
| 35   | 21.37                              | 30.43                  | - 4.23       | 0.67                                    | 32.04                  | 43.57                  | 64.08                  | - 4.33       | 0.68                                    |
| 40   | 17.34                              | 24.70                  | - 4.12       | 0.99                                    | 25.87                  | 35.19                  | 51.75                  | - 4.22       | 1.01                                    |
| 45   | 14.15                              | 20.15                  | - 4.01       | 1.29                                    | 21.01                  | 28.57                  | 42.02                  | - 4.11       | 1.33                                    |
| 50   | 11.61                              | 16.53                  | - 3.91       | 1.59                                    | 17.15                  | 23.33                  | 34.31                  | - 4.00       | 1.63                                    |
| 55   | 9.572                              | 13.63                  | - 3.81       | 1.88                                    | 14.08                  | 19.15                  | 28.16                  | - 3.90       | 1.93                                    |
| 60   | 7.931                              | 11.30                  | - 3.71       | 2.16                                    | 11.61                  | 15.79                  | 23.22                  | - 3.80       | 2.21                                    |
| 65   | 6.603                              | 9.404                  | - 3.62       | 2.43                                    | 9.623                  | 13.09                  | 19.25                  | - 3.71       | 2.49                                    |
| 70   | 5.522                              | 7.865                  | - 3.53       | 2.70                                    | 8.012                  | 10.90                  | 16.02                  | - 3.62       | 2.76                                    |
| 75   | 4.639                              | 6.607                  | - 3.44       | 2.95                                    | 6.701                  | 9.114                  | 13.40                  | - 3.53       | 3.03                                    |
| 80   | 3.913                              | 5.573                  | - 3.36       | 3.20                                    | 5.629                  | 7.655                  | 11.26                  | - 3.45       | 3.28                                    |
| 85   | 3.315                              | 4.721                  | - 3.28       | 3.45                                    | 4.748                  | 6.457                  | 9.496                  | - 3.36       | 3.53                                    |
| 90   | 2.819                              | 4.015                  | - 3.20       | 3.68                                    | 4.021                  | 5.469                  | 8.042                  | - 3.28       | 3.77                                    |
| 95   | 2.406                              | 3.427                  | - 3.13       | 3.91                                    | 3.419                  | 4.649                  | 6.837                  | - 3.21       | 4.01                                    |
| 100  | 2.062                              | 2.936                  | - 3.05       | 4.13                                    | 2.918                  | 3.968                  | 5.835                  | - 3.13       | 4.24                                    |
| 105  | 1.773                              | 2.525                  | - 2.98       | 4.35                                    | 2.499                  | 3.399                  | 4.998                  | - 3.06       | 4.46                                    |
| 110  | 1.530                              | 2.179                  | - 2.92       | 4.56                                    | 2.148                  | 2.921                  | 4.296                  | - 2.99       | 4.68                                    |
| 115  | 1.324                              | 1.886                  | - 2.85       | 4.77                                    | 1.853                  | 2.519                  | 3.705                  | - 2.93       | 4.89                                    |
| 120  | 1.150                              | 1.638                  | - 2.79       | 4.97                                    | 1.603                  | 2.180                  | 3.206                  | - 2.86       | 5.09                                    |
| 125  | 1.002                              | 1.427                  | - 2.73       | 5.17                                    | 1.392                  | 1.892                  | 2.783                  | - 2.80       | 5.29                                    |
| 130  | 0.8757                             | 1.247                  | - 2.67       | 5.36                                    | 1.212                  | 1.648                  | 2.423                  | - 2.74       | 5.49                                    |
| 135  | 0.7675                             | 1.093                  | - 2.61       | 5.54                                    | 1.058                  | 1.439                  | 2.116                  | - 2.68       | 5.68                                    |
| 140  | 0.6746                             | 0.9608                 | - 2.55       | 5.73                                    | 0.9269                 | 1.261                  | 1.854                  | - 2.62       | 5.87                                    |
| 145  | 0.5946                             | 0.8468                 | - 2.50       | 5.90                                    | 0.8141                 | 1.107                  | 1.628                  | - 2.57       | 6.05                                    |
| 150  | 0.5254                             | 0.7483                 | - 2.45       | 6.08                                    | 0.7170                 | 0.9752                 | 1.434                  | - 2.51       | 6.23                                    |



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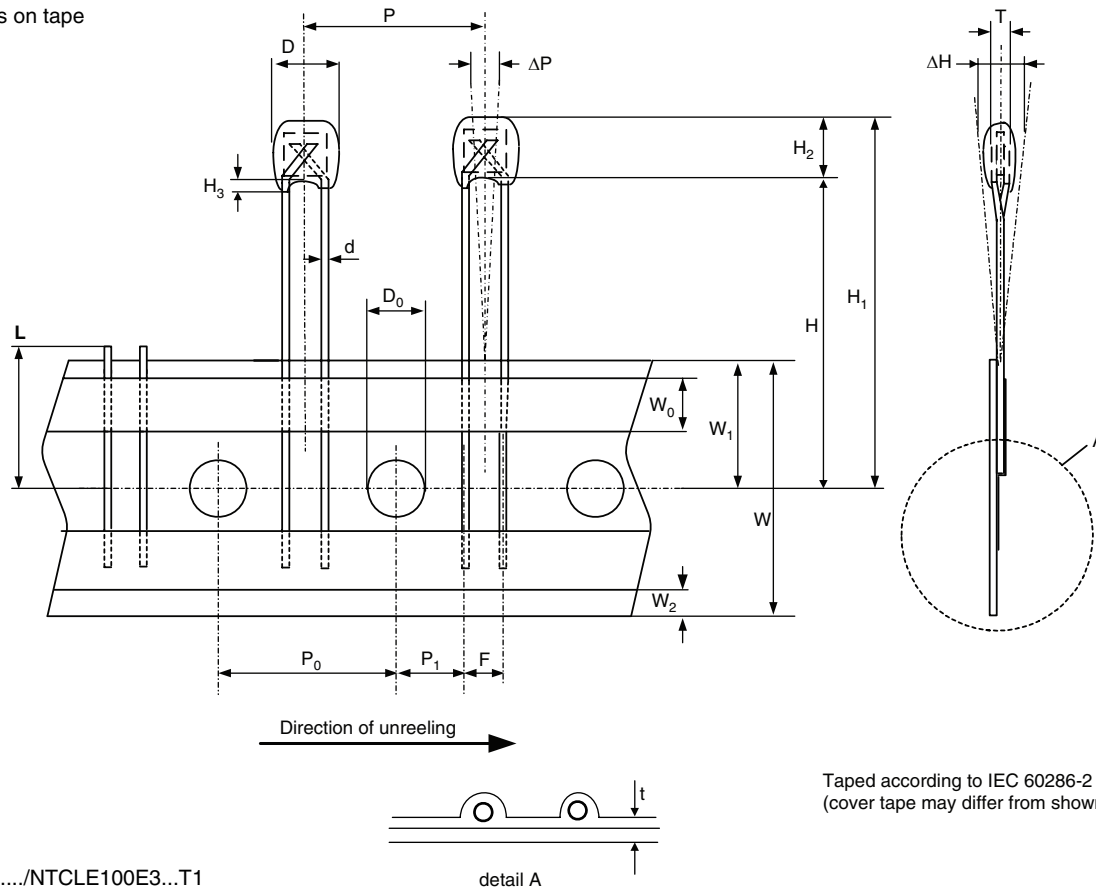
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| <b>RESISTANCE VALUES AT INTERMEDIATE TEMPERATURES WITH R<sub>25</sub> AT 150, 220, 330 AND 470 kΩ</b> |                                    |                        |              |  |                        |                        |              |  |
|---|------------------------------------|------------------------|--------------|--|------------------------|------------------------|--------------|--|
| T <sub>oper</sub><br>[°C]   | PART NR.<br>2381 640<br>NTCLE100E3 |                        |              |  |                        |                        |              |  |
|   | **154<br>154***                    | **224<br>224***        | TCR<br>[%/K] | ΔR/RDUE<br>TO B <sub>tol.</sub><br>[%] | **334<br>334***        | **474<br>474***        | TCR<br>[%/K] | ΔR/RDUE<br>TO B <sub>tol.</sub><br>[%] |
|   | R <sub>T</sub><br>[kΩ]             | R <sub>T</sub><br>[kΩ] |              |  | R <sub>T</sub><br>[kΩ] | R <sub>T</sub><br>[kΩ] |              |  |
| - 40  | 6153                               | 9024                   | - 6.83       | 10.22                                  | 16 044                 | 22 850                 | - 7.14       | 6.41                                   |
| - 35  | 4394                               | 6444                   | - 6.64       | 9.24                                   | 11 282                 | 16 068                 | - 6.94       | 5.80                                   |
| - 30  | 3168                               | 4646                   | - 6.45       | 8.29                                   | 8013                   | 11 413                 | - 6.74       | 5.20                                   |
| - 25  | 2305                               | 3381                   | - 6.27       | 7.39                                   | 5747                   | 8185                   | - 6.55       | 4.64                                   |
| - 20  | 1693                               | 2483                   | - 6.09       | 6.52                                   | 4161                   | 5926                   | - 6.37       | 4.09                                   |
| - 15  | 1254                               | 1839                   | - 5.92       | 5.68                                   | 3040                   | 4329                   | - 6.19       | 3.57                                   |
| - 10  | 936.4                              | 1373                   | - 5.75       | 4.88                                   | 2240                   | 3190                   | - 6.02       | 3.06                                   |
| - 5   | 705.0                              | 1034                   | - 5.60       | 4.10                                   | 1665                   | 2371                   | - 5.85       | 2.57                                   |
| 0   | 535.0                              | 784.7                  | - 5.44       | 3.36                                   | 1248                   | 1777                   | - 5.69       | 2.11                                   |
| 5   | 409.1                              | 600.0                  | - 5.29       | 2.64                                   | 942.3                  | 1342                   | - 5.54       | 1.65                                   |
| 10  | 315.1                              | 462.1                  | - 5.15       | 1.94                                   | 717.1                  | 1021                   | - 5.39       | 1.22                                   |
| 15  | 244.4                              | 358.4                  | - 5.01       | 1.27                                   | 549.8                  | 783.0                  | - 5.24       | 0.80                                   |
| 20  | 190.8                              | 279.9                  | - 4.88       | 0.63                                   | 424.5                  | 604.6                  | - 5.10       | 0.39                                   |
| 25  | 150.0                              | 220.0                  | - 4.75       | 0.00                                   | 330.0                  | 470.0                  | - 4.97       | 0.00                                   |
| 30  | 118.6                              | 174.0                  | - 4.63       | 0.60                                   | 258.2                  | 367.8                  | - 4.84       | 0.38                                   |
| 35  | 94.42                              | 138.5                  | - 4.51       | 1.19                                   | 203.4                  | 289.6                  | - 4.72       | 0.75                                   |
| 40  | 75.58                              | 110.9                  | - 4.39       | 1.76                                   | 161.1                  | 229.5                  | - 4.59       | 1.10                                   |
| 45  | 60.85                              | 89.24                  | - 4.28       | 2.30                                   | 128.4                  | 182.9                  | - 4.48       | 1.45                                   |
| 50  | 49.25                              | 72.24                  | - 4.17       | 2.83                                   | 103.0                  | 146.7                  | - 4.37       | 1.78                                   |
| 55  | 40.08                              | 58.78                  | - 4.07       | 3.35                                   | 83.00                  | 118.2                  | - 4.26       | 2.10                                   |
| 60  | 32.78                              | 48.08                  | - 3.97       | 3.85                                   | 67.26                  | 95.80                  | - 4.15       | 2.41                                   |
| 65  | 26.94                              | 39.51                  | - 3.87       | 4.33                                   | 54.79                  | 78.04                  | - 4.05       | 2.72                                   |
| 70  | 22.25                              | 32.63                  | - 3.78       | 4.80                                   | 44.85                  | 63.88                  | - 3.95       | 3.01                                   |
| 75  | 18.46                              | 27.07                  | - 3.69       | 5.26                                   | 36.90                  | 52.55                  | - 3.86       | 3.30                                   |
| 80  | 15.38                              | 22.56                  | - 3.60       | 5.70                                   | 30.49                  | 43.43                  | - 3.77       | 3.58                                   |
| 85  | 12.87                              | 18.88                  | - 3.52       | 6.14                                   | 25.31                  | 36.05                  | - 3.68       | 3.85                                   |
| 90  | 10.82                              | 15.87                  | - 3.44       | 6.56                                   | 21.10                  | 30.06                  | - 3.59       | 4.11                                   |
| 95  | 9.129                              | 13.39                  | - 3.36       | 6.96                                   | 17.67                  | 25.16                  | - 3.51       | 4.37                                   |
| 100   | 7.732                              | 11.34                  | - 3.28       | 7.36                                   | 14.85                  | 21.15                  | - 3.43       | 4.62                                   |
| 105   | 6.574                              | 9.642                  | - 3.21       | 7.75                                   | 12.53                  | 17.85                  | - 3.35       | 4.86                                   |
| 110   | 5.610                              | 8.228                  | - 3.14       | 8.13                                   | 10.62                  | 15.12                  | - 3.28       | 5.10                                   |
| 115   | 4.804                              | 7.046                  | - 3.07       | 8.49                                   | 9.029                  | 12.86                  | - 3.21       | 5.33                                   |
| 120   | 4.128                              | 6.054                  | - 3.00       | 8.85                                   | 7.704                  | 10.97                  | - 3.14       | 5.55                                   |
| 125   | 3.559                              | 5.219                  | - 2.94       | 9.20                                   | 6.597                  | 9.396                  | - 3.07       | 5.77                                   |
| 130   | 3.078                              | 4.514                  | - 2.87       | 9.54                                   | 5.668                  | 8.072                  | - 3.00       | 5.99                                   |
| 135   | 2.670                              | 3.916                  | - 2.81       | 9.87                                   | 4.885                  | 6.958                  | - 2.94       | 6.20                                   |
| 140   | 2.323                              | 3.408                  | - 2.75       | 10.20                                  | 4.224                  | 6.016                  | - 2.88       | 6.40                                   |
| 145   | 2.028                              | 2.974                  | - 2.69       | 10.52                                  | 3.663                  | 5.217                  | - 2.82       | 6.60                                   |
| 150   | 1.774                              | 2.603                  | - 2.64       | 10.83                                  | 3.186                  | 4.538                  | - 2.76       | 6.79                                   |

**PACKAGING  
TAPE SPECIFICATIONS**

Thermistors on tape



**1E pitch**

2381 640 4.../NTCLE100E3...T1

| DIMENSIONS in millimeters                |                |                    |                |  |
|--|----------------|--------------------|----------------|--|
| DETAILS                                  | SYMBOL         | DIMENSIONS NOMINAL | TOLERANCE      | REMARKS  |
| Body diameter                            | D              | 3.3                | ± 0.5          | 5 max. for 4.338 to 4.221  |
| Lead diameter                            | d              | 0.6                | ± 10 %         |  |
| Feed hole diameter                       | D <sub>0</sub> | 4.0                | ± 0.2          |  |
| Lead to lead distance                    | F              | 2.54               | ± 0.3          | Guaranteed between component and tape  |
| Distance component to tape centre        | H              | 22.0               | ± 1.0          | Guaranteed between component and tape  |
| Component height                         | H <sub>1</sub> | 32.2               | max.           |  |
| Component alignment                      | Δh             | 0                  | ± 2.0          |  |
| Distance top/bottom of components        | H <sub>2</sub> | 6                  | max.           |  |
| Length of lacquer under the comp. bottom | H <sub>3</sub> | 2                  | ± 1            |  |
| Length of snapped lead                   | L              | 11.0               | max.           |  |
| Pitch between thermistors                | P              | 12.7               | ± 1.0          | Cumulative pitch error ± 1 mm/20 pitches guaranteed between component and tape |
| Feed hole pitch                          | P <sub>0</sub> | 12.7               | ± 0.3          |  |
| Feed hole center to lead center          | P <sub>1</sub> | 5.08               | ± 0.7          |  |
| Component alignment                      | Δp             | 0                  | ± 1.3          |  |
| Total thickness                          | T              | 3.0                | max.           | 4 max. for 4.338 to 4.221 with cardboard tape 0.5 ± 0.1                        |
| Total tape thickness                     | t              | 0.9                | max.           |  |
| Tape width                               | W              | 18.0               | ± 1.0<br>- 0.5 | None of the hold down tapes may cover the holes                                |
| Hold down tape width                     | W <sub>0</sub> | 5.0                | ± 0.3          |  |
| Hole position                            | W <sub>1</sub> | 9.0                | ± 0.5          |  |
| Hold down tape position                  | W <sub>2</sub> | 1.5                | ± 1            |  |
| Inspection level: mechanical: S3         |                |                    |                |  |

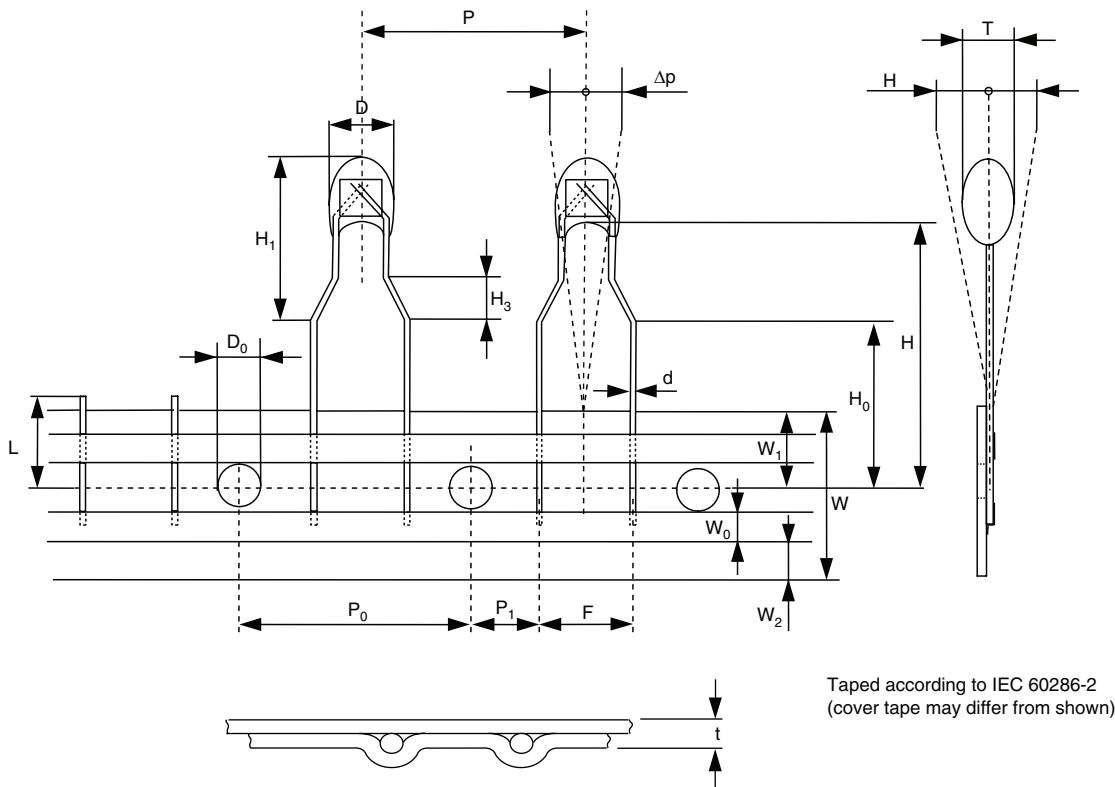


# 2381 640 3/4/6..../NTCLE100E3...B0/T1/T2

NTC Thermistors, Radial Leaded,  
Standard Precision

Vishay BCcomponents

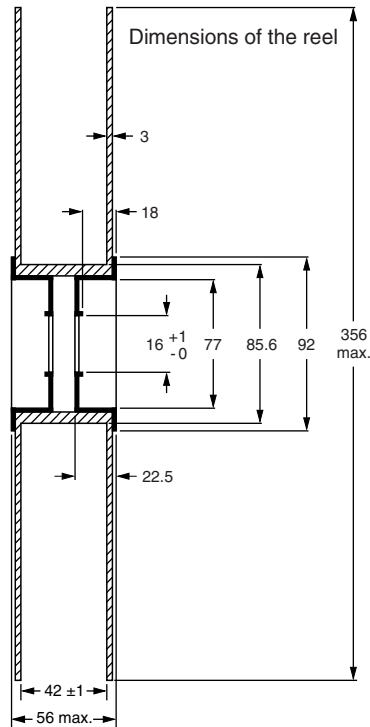
Thermistors on tape



2E pitch

| DIMENSIONS in millimeters         |                |                    |                |  |
|-----------------------------------|----------------|--------------------|----------------|--|
| DETAILS                           | SYMBOL         | DIMENSIONS NOMINAL | TOLERANCE      | REMARKS  |
| Body diameter                     | D              | 3.3                | ± 0.5          | 5 max. for 3.338 to 3.221  |
| Lead diameter                     | d              | 0.6                | ± 10 %         |  |
| Feed hole diameter                | D <sub>0</sub> | 4.0                | ± 0.2          |  |
| Lead to lead distance             | F              | 5.0                | + 0.6<br>- 0.1 | Guaranteed between component and tape  |
| Distance component to tape centre | H              | 20.0               | ± 2            | 12 max. for 3.101 to 3.221   |
| Component height                  | H <sub>0</sub> | 16.0               | ± 0.5          |  |
| Component top to seating plane    | H <sub>1</sub> | 10.0               | max.           |  |
| Component alignment               | Δh             | 0.0                | ± 2.0          |  |
| Distance top - bottom lead clinch | not defined    |                    |                |  |
| Length of snapped lead            | L              | 11.0               | max.           |  |
| Pitch between thermistors         | P              | 12.7               | ± 1.0          | Cumulative pitch error ± 1 mm/20 pitches guaranteed between component and tape |
| Feed hole pitch                   | P <sub>0</sub> | 12.7               | ± 0.3          |  |
| Feed hole center to lead center   | P <sub>1</sub> | 3.81               | ± 0.7          |  |
| Component alignment               | Δp             | 0.0                | ± 1.3          |  |
| Total thickness                   | T              | 3.0                | max.           | 4 max. for 3.338 to 3.221 with cardboard tape 0.5 ± 0.1                        |
| Total tape thickness              | t              | 0.9                | max.           |  |
| Tape width                        | W              | 18.0               | ± 1.0<br>- 0.5 | None of the hold down tapes may cover the holes                                |
| Hold down tape width              | W <sub>0</sub> | 5.0                | ± 0.3          |  |
| Hole position                     | W <sub>1</sub> | 9.0                | ± 0.5          |  |
| Hold down tape position           | W <sub>2</sub> | 1.5                | ± 1.0          |  |
| Inspection level: mechanical: S3  |                |                    |                |  |

**REEL SPECIFICATIONS**



| CODE NUMBERS AND RELEVANT PACKAGING QUANTITIES |                                   |  |  |
|--|-----------------------------------|--|--|
| PARAMETER                                      | BULK                              | TAPE AND REEL <sup>(1)</sup><br>1E PITCH | TAPE AND REEL <sup>(1)</sup><br>2E PITCH |
|  | 2381 640 6.../<br>NTCLE100E3...B0 | 2381 640 4.../<br>NTCLE100E3...T1        | 2381 640 3.../<br>NTCLE100E3...T2        |
| Quantity                                       | 500                               | 1500 per reel, 2 reels per box           | 1500 per reel, 2 reels per box           |

**Note**  
<sup>(1)</sup> Taped according IEC 60286-2

**CHARACTERISTICS OF TAPED PRODUCTS**

- Minimum pull-out force of the component: 5 N
- Minimum peel-off force of adhesive tape: 6 N
- Minimum tearing force tape: 15 N
- Minimum pull-off force of tape-reel: 5 N

**STORAGE CONDITIONS**

- Storage temperature range: - 25 °C to + 40 °C
- Maximum relative humidity: 80 %, non-condensing

**TESTS AND REQUIREMENTS**

Essentially all tests are carried out in accordance with "IEC publication 60068-2; Environmental testing", except where indicated.

| STABILITY TESTS        |                               |   |  |  |
|------------------------|-------------------------------|---|--|--|
| CECC 32 100<br>CLAUSE  | IEC<br>60068-2<br>TEST METHOD | TEST  | PROCEDURE  | REQUIREMENTS                             |
| D3; 4.20.1             |                               | Endurance   | 25 °C; 1000 h  | $\Delta R/R < 1 \%$                      |
|                        | 1                             | Endurance   | - 40 °C; 1000 h  | $\Delta R/R < 1 \%$                      |
|                        | 539                           | Endurance   | 500 mW; 55 °C; 1000 h  | $\Delta R/R < 3 \%$ <sup>(1)</sup>       |
|                        | 2                             | Dry heat,<br>(steady state)                         | 125 °C; 1000 h   | $\Delta R/R < 3 \%$                      |
| D1; 4.19               | 3                             | Damp heat<br>(steady state)                         | 56 days at 40 °C; 90 to 95 % RH  | $\Delta R/R < 3 \%$                      |
| C2; 4.14               | 14                            | Rapid change of temperature                         | - 40 °C to + 125 °C; 50 cycles   | $\Delta R/R < 2 \%$                      |
| Other applicable tests |                               |   |  |  |
|                        | 21                            | Robustness of leads:<br>Tensile strength<br>Bending | Loading force 10 N<br>Loading force 5 N  | $\Delta R/R \leq 1 \%$                   |
|                        | 58                            | Soldering:<br>Solderability<br>Resistance to heat   | 240 °C max.; duration 4 s max.<br>265 °C max.; duration 5 s max.   | $\Delta R/R \leq 1 \%$ <sup>(2)</sup>    |
|                        | 27                            | Impact  | Free fall; 1 m   | $\Delta R/R \leq 1 \%$                   |
|                        | 29                            | Shock   | 490 m/s; half sinewave   | $\Delta R/R \leq 1 \%$                   |
|                        | 45                            | Resistance to solvent (isopropanol)                 | Ambient temp for 5 minutes;<br>5 N with hydrophylic cotton wool  | No traces of lacquer on cotton wool      |
|                        | 6                             | Vibration   | 1.5 mm peak to peak: 10 Hz to 58 Hz<br>10 gp: 50 Hz to 500 Hz 1 octave/min. 2 h in each direction in three orthogonal directions | No visible damage<br>$\Delta R/R < 1 \%$ |
|                        | 60695-2-2                     | Inflammability                                      | 1980, needle flame test  | Non-flammable                            |

**Notes**  
<sup>(1)</sup> For  $R_{25} \geq 100 \text{ k}\Omega$  the drift requirement is  $\Delta R/R < 5 \%$   
<sup>(2)</sup> For  $R_{25}$  from 2.2 k $\Omega$  to 10 k $\Omega$ , requirement is  $\pm 2 \%$  max.





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